WORTHINGTON

EQUIPMENT FOR BUILDINGS AND INSTITUTIONS

AIR CONDITIONING UNITS—SERIES 40

For use with Remote Supply of Refrigeration

Vertical Floor Mounted Type DV and WV
Horizontal Suspended Type DH and WH } **6 to 30 Tons***

(D indicates Direct Expansion Units—W indicates Chilled Water Units).

FOR YEAR-ROUND AIR CONDITIONING

These units provide complete air conditioning for medium-sized installations. If desired they can be supplied without heating section and humidifier for summer and mid-season operation only. All elements of this unit are in balance with the remainder of the assembly for efficient operation. Freon-12 Compressors, of "balanced design" to complete these systems are described on page 4.

TYPES

Types DV and WV Air Conditioning Units are of vertical design for floor mounting and can be arranged for either vertical or horizontal discharge blowing from front or rear of unit.

Types DH and WH Air Conditioning Units are of horizontal design for suspended mounting.

Both types can be supplied with cooling coils either for direct expansion Freon-12 or chilled water.

WORTHINGTON FEATURES

- Standardized Design—Each element is in balance with the remainder of the assembly to produce the most desirable results at the lowest possible investment and operating cost.
- Bonderized—All metal parts; casings, fan wheel and housing, are *bonderized* for added protection against corrosion.
- Quiet Operation—Special slow speed fan, statically balanced for quiet, vibration-free operation, plus a carefully insulated casing, ensures minimum noise.

CONSTRUCTION

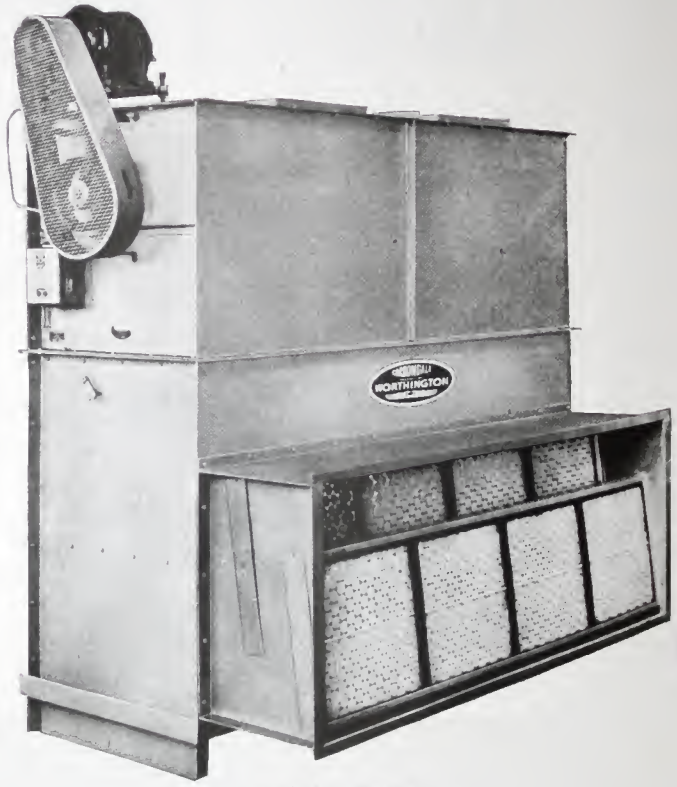
Casing: Constructed of heavy sheet steel, *bonderized* for long life, finished in gray enamel and thoroughly insulated.

Fan: Slow speed centrifugal type, statically balanced for smooth operation.

Cooling Coils and Heating Coils:

Filter Box and Filters: Bonderized steel chamber with removable "Dust-Stop" filters.

Humidifier: Self cleaning nozzle spray type with built-in strainer.



Vertical Floor Mounted
Type DV and WV Series 40

Horizontal Suspended
Type DH and WH Series 40

SIZES AND DIMENSIONS—SERIES 40

Unit	Nominal Ratings			Dimensions in Inches			
	Cooling Tons*	Air Cfm.	Heating Btu./hr.**	Length	Width	Height	Depth
140-DV	6	2,000	145,400	78	50	90	37
140-DH	6	2,000	145,400		50	31	
240-DV	12	4,000	290,800	86	79	90	44
240-DH	12	4,000	290,800		79	31	
340-DV	18	6,000	436,200	93	91	100	51
340-DH	18	6,000	436,200		91	37	
440-DV	24	8,000	581,600	101	98	110	56
440-DH	24	8,000	581,600		98	42	
540-DV	30	10,000	727,000	111	103	121	65
540-DH	30	10,000	727,000		103	48	

* Nominal cooling capacity based on entering air 80°F.-D.B., 67° F.-W.B. with fan capacity as shown, and compressor operating at 40° F. suction temperature.
** Nominal heating capacity based on entering air 70° F.-D.B. Air volume at 500° face velocity.

REFRIGERATION COMPRESSORS

Compressor and Compressor-Condenser Units

For Freon-12 or Methyl-Chloride
Series CB—1/4 to 2 Hp.
Series HS—3 to 7 1/2 Hp.
Series HF—10 to 100 Hp.

Worthington Refrigerating Units are designed for all air conditioning and refrigeration applications up to 200 Tons. In the various models are embodied the most modern design features—resulting in compact units which will give years of efficient, trouble-free service.

TYPES AND CONSTRUCTIONS

Series CB Compressors from 1/4 to 2 Hp. are vertical two-cylinder type, equipped with air cooled condensers and are available with water cooled condensers from 1/2 to 2 Hp.

Series HS Compressors, 3 and 5 Hp., are vertical two-cylinder type; the 7 1/2 Hp. is a four-cylinder V-type with Worthington Feather Valves. Adequate lubrication of this series is insured by a splash system. The crank shaft revolves in a bath of oil, supplying lubrication to all bearings, seal, and cylinder walls.

Series HF Compressors, from 10 to 100 Hp., are four-cylinder V-type and six-cylinder W type, equipped with Worthington Feather Valves.† Full force-feed lubrication is used throughout this series. The seal is of the Sylphon-Bellows type with a special bearing metal running against a hardened steel shoulder, which insures against leakage around the shaft.

Capacities over 100 tons are secured with duplex models, mounting two compressors with one motor in between on a single base. All units are ruggedly constructed, but surprisingly light in weight, being especially desirable for installation where floor space or head room is limited and a refrigeration unit of large capacity is required.

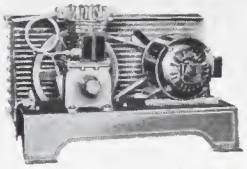
These units can be supplied either with a horizontal cleanable type shell and tube condenser mounted on the unit; or for use with the Worthington Shower Condenser.

†Reg. U. S. Pat. Off.

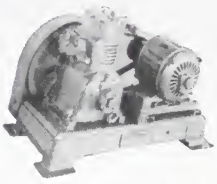
SIZES AND CAPACITIES

Unit Numbers			Nominal* Rating	Motor Hp.	No. of Cyl.
Air-cooled Condenser	Water-cooled Condenser	Shower Condenser			
CB-15A			2,500 Btu./hr.	1/4	2
CB-33A			3,600 Btu./hr.	1/3	2
CB-50A			5,000 Btu./hr.	1/2	2
CB-75A			8,150 Btu./hr.	3/4	2
CB-100A			10,200 Btu./hr.	1	2
CB-150A			13,100 Btu./hr.	1 1/2	2
CB-200A			16,750 Btu./hr.	2	2
	CB-50W		7,500 Btu./hr.	1/2	2
	CB-75W		13,200 Btu./hr.	3/4	2
	CB-100W		17,800 Btu./hr.	1	2
	CB-150W		21,700 Btu./hr.	1 1/2	2
	CB-200W		27,600 Btu./hr.	2	2
	3HS2-3W	3HS2-3S	3.0 Tons	3	2
	3HS2-5W	3HS2-5S	5.1 Tons	5	2
	3HS4-7 1/2W	3HS4-7 1/2S	7.8 Tons	7 1/2	4
	3HF4-10W	3HF4-10S	10.0 Tons	10	4
	4HF4-15W	4HF4-15S	16.2 Tons	15	4
	4HF4-20W	4HF4-20S	22.0 Tons	20	4
	4HF4-25W	4HF4-25S	27.2 Tons	25	4
	4HF6-30W	4HF6-30S	32.5 Tons	30	6
	4HF6-40W	4HF6-40S	44.5 Tons	40	6
	6HF4-50W	6HF4-50S	56.0 Tons	50	4
	6HF4-60W	6HF4-60S	66.5 Tons	60	4
	6HF6-75W	6HF6-75S	91.3 Tons	75	6
	6HF6-100W	6HF6-100S	110.0 Tons	100	6

*Nominal Ratings: 40° F. Suction and 105° F. Condensing Temperatures, Water Cooled Condenser.
20° F. Suction and 90° F. Ambient Temperatures, Air Cooled Condenser.

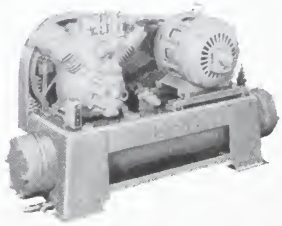


CB Air Cooled Freon-12 or Methyl-Chloride Units—1/4 to 2 Hp.



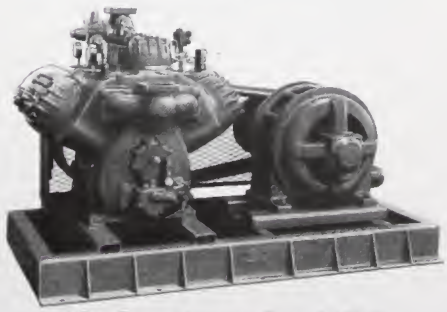
3HS2—Freon-12 or Methyl-Chloride Units—3 and 5 Hp. for use with shower condenser

3HS4—Freon-12 or Methyl-Chloride Units—7 1/2 Hp. for use with shower condenser



3HF4—Freon-12 Units—10 Hp. with water cooled condenser

4HF4—Freon-12 Units—10-25 Hp. with water cooled condenser



6HF6—Freon-12 Units—75 and 100 Hp. for use with shower condenser

SELF-CONTAINED AIR CONDITIONERS

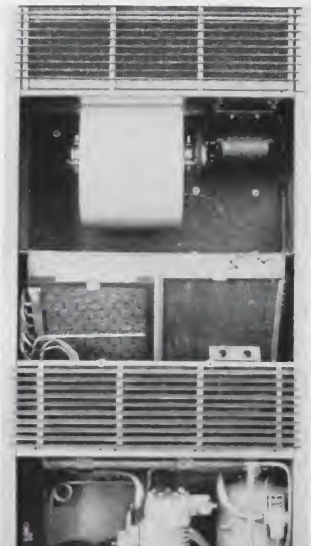
Worthington Self-Contained (Model SCY series) Air Conditioners are designed to provide cooling (and heating if desired), dehumidification, ventilation, circulation, and air cleaning for commercial and small industrial applications where cooling capacities up to five tons can be used.

There are two sizes available: Model SCY-300 having 3 hp. and Model SCY-500 having 5 hp. Each unit is composed of a motor-driven Worthington two-cylinder reciprocating compressor; finned copper tubing condenser; large surface finned cooling coils; quiet low-speed fan with motor; standard size throw-away filters; and convenient concealed controls for selection of temperatures and air volume (Temperature is maintained automatically by thermostatic control after dial is set). Freon 12 is used as the refrigerant. Cabinets are of steel, electrically welded and fully insulated thermally and acoustically. All steel work is bonderized and coated, both inside and out, with highly resistant primers and finished in plastic baked enamel. Easily demountable panels give complete access to all operational parts. Discharge grills are adjustable to direct the air in any direction and are part of the discharge plenum section which may be purchased as optional equipment.

When the unit is used with duct work, better efficiency and lower costs may be had by connecting the duct directly to the fan outlet and omitting the discharge plenum.

All electric motors and drives are of a standard type which has been used and proved satisfactory on thousands of Worthington installations. Motors are available for use on all standard alternating current characteristics.

Left: Model SCY-300 cabinet of modern design and plastic baked enamel finish. (Model SCY-500 cabinet similar.)



Right: Interior view of Model SCY-300 showing the easily serviced, compact arrangement of component parts. (Model SCY-500 is similar.)

CAPACITIES

UNIT	COMPRESSOR MOTOR	FAN MOTOR	NORMAL CFM	*TOTAL HEAT CAPACITY	
				COOLING UNITS (B. T. U. per hr.)	TONS REFRIGERATION
SCY-300	3 HP.	1/3 HP.	1200	36,000	3.0
SCY-500	5 HP.	1/2 HP.	2000	60,000	5.0

*Total Heat Capacity is given at A. S. R. E. (American Society of Refrigeration Engineers) standard rating conditions, which specify that air shall enter the unit at 80° F. dry bulb, 50% relative humidity, with condenser water entering at 75° F. and leaving at 95° F.

REFRIGERATION COMPRESSORS

Vertical Single Acting and Horizontal Double Acting Types

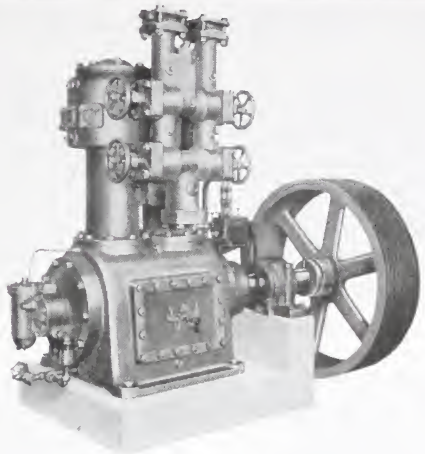
FOR AMMONIA AND OTHER REFRIGERANTS

Vertical Single Acting Compressors

CAPACITIES—10 to 150 Tons

The design of Worthington Vertical, Two-cylinder, Single Acting Refrigeration Compressors includes such important features as water jacketed cylinders, forged steel crank shaft and connecting rods, heavy duty roller type main bearings and safety heads in each cylinder. These units are furnished with a single manifold containing main suction, discharge, by-pass and pump out valves, relief valve and suction strainer.

Full force feed lubrication, with oil filter, for all running gear is incorporated in the 6″x6″ to 10″x10″ sizes with an additional belt-driven force feed lubricator for cylinder and piston lubrication. These compressors have heavy duty roller type outboard bearings.



Vertical Single Acting Compressor
Arranged for Multi-V-Belt Drive

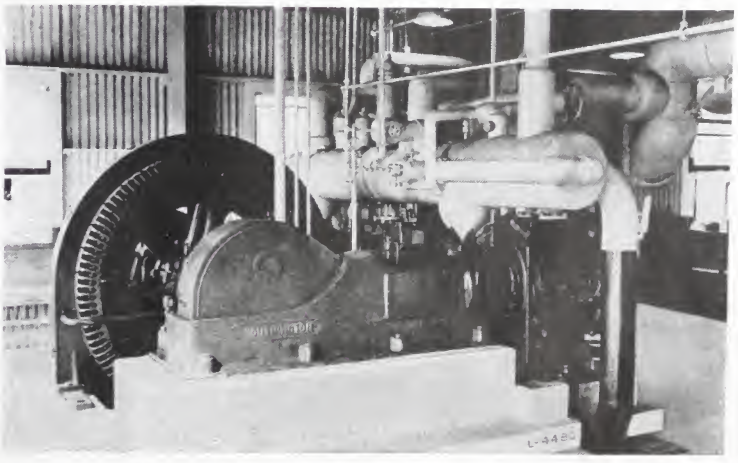
Horizontal Double Acting Compressors

CAPACITIES: 50 to 1000 Tons

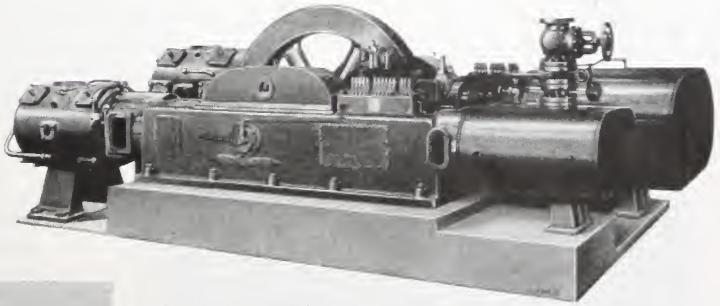
Worthington Horizontal Double Acting Refrigeration Compressors are available in single or duplex types and for single or two stage compression; to meet a wide variety of operating conditions. The duplex type is particularly suited to low temperature applications where two stage compression must be used.

Frames and running gear are built for continuous duty. Lubrication is automatic. Cylinders are specially designed and constructed for refrigeration service with water jackets around discharge valves, and are fitted with deep main stuffing boxes with an auxiliary seal, both of which are correctly vented and lubricated.

If desired, horizontal compressors are furnished with Worthington Double Seal Housings. This double seal feature is so designed that no part of the piston rod which enters the compressor cylinder passes through the frame oil head, a feature particularly desirable on certain special applications.



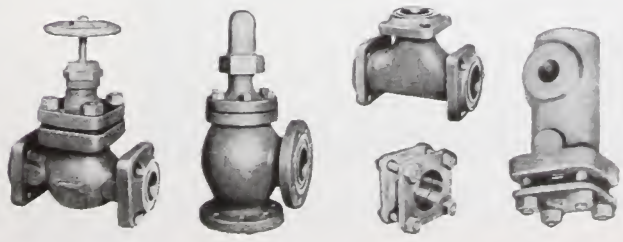
Horizontal Duplex Compressor Synchronous Motor Drive



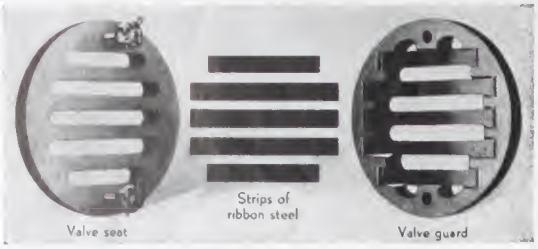
Above: Horizontal Duplex Opposed Type Steam Engine Driven Ammonia Compressor

AMMONIA VALVES AND FITTINGS

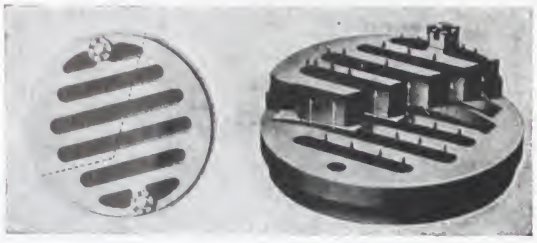
Worthington Valves and Fittings are designed especially for refrigeration service. Ammonia and Freon-12 valves are ruggedly constructed as evidenced by special tests by which valve bodies have been subjected to hydraulic pressures exceeding 5,000 lbs. per sq. in. before showing undue strain. Every valve and fitting is tested with 300 lbs. air pressure.



ALL COMPRESSORS HAVE WORTHINGTON FEATHER VALVES



Component parts of the Feather Valve



Partial Section of Feather Valve showing flow of gas

The Worthington Feather Valve† is the simplest, most durable and efficient compressor valve made. It consists of strips of very flexible ribbon steel which seat tightly on ground face, slotted seats. In opening, the valve is allowed to lift in the middle against a curved guard, permitting the passage of gas on either side.

The strips are not held rigidly at any point, being restrained from lateral movement by recesses in the curved guard. Steel inserts at the ends of the slots prevent any possibility of end pinching.

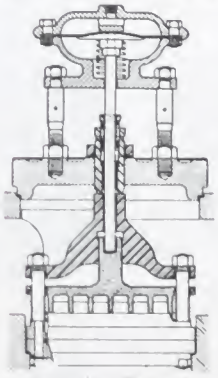
The valve element, shown at the left, consists essentially of three parts: the strip valve, the seat and the guard.

†Reg. U. S. Pat. Off.

ADVANTAGES

Extreme simplicity . . . quiet operation . . . durable and reliable . . . minimum gas friction. The valve seats by contact and not by impact . . . intake and discharge valves interchangeable . . . convenience of access . . . minimum cost of maintenance.

VARIABLE CAPACITY CONTROLS—For Higher Efficiency

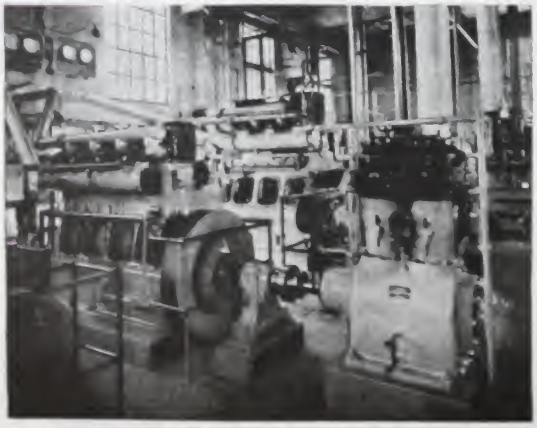


Unloading Element

Variable automatic capacity control for Worthington Horizontal Double Acting Compressors is available in the type illustrated at the left. With this control the reduction in capacity is accomplished by holding open the suction valve strips to allow free passage of the gas into and out of the cylinder without compression, in such sequence as required to balance the compressor capacity with the varying evaporation load. The compressor discharge gas may supply the power for actuating the unloader system or it may be air actuated. Several types of power elements are available for this type unloader.

Manually operated clearance pocket type capacity control for Horizontal Double Acting and for Vertical Single Acting Refrigeration Compressors can also be furnished.

Manually operated clearance pocket type capacity control may also be used in conjunction with the automatic suction valve control, to give intermediate steps of capacity control. Also by fixing the number of clearance pockets kept open, it is possible to limit the maximum demand where this may be desired.



Two Worthington Vertical Two-cylinder Single Acting Ammonia Compressors direct driven by Worthington Diesel Engines in the plant of a Southern ice company

DRIVES AND DRIVER EQUIPMENT

Worthington Refrigeration Compressors can be driven from any type of power unit, by the following methods:

Direct Connection—through flexible coupling to Diesel or gas engine, or through gear reduction unit to steam turbine. Worthington Gas, Diesel, or Convertible Gas-Diesel Engines and Worthington-Moore Steam Turbines are available in sizes particularly adapted to driving these compressors.

Direct Connection—Rotor of synchronous motor mounted directly on compressor shaft.

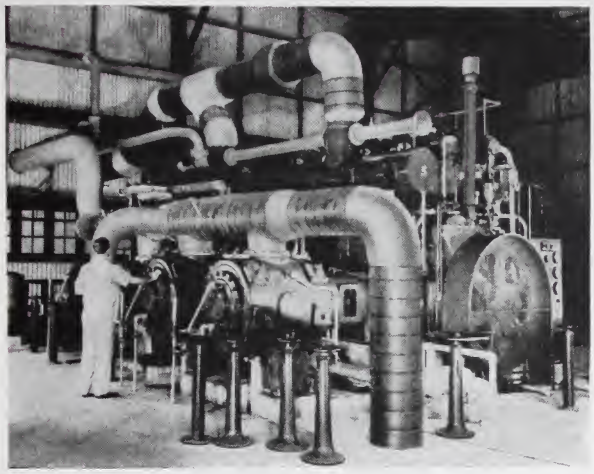
Horizontal Duplex Compressors, in the smaller sizes, can be arranged for belt drive. Larger sizes are best suited for mounting rotor of synchronous motor directly on compressor shaft between the compressor frames.

Horizontal Compressors are also furnished with ammonia cylinders and power cylinders of steam or gas engine mounted on the same frame and using one crank shaft, making a very compact, space-saving unit.

ANGLE GAS ENGINE COMPRESSORS

For Refrigeration

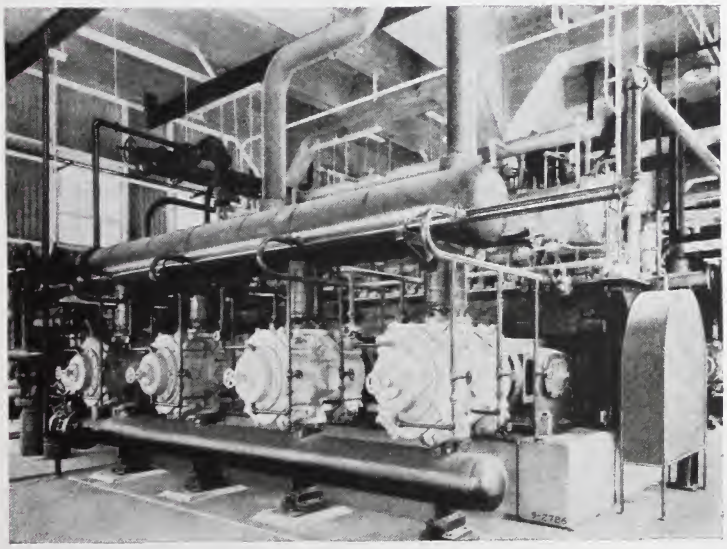
Type LTC—400 to 1000 Hp.



Worthington Angle Two-Cycle Gas Engine
Ammonia Refrigeration Compressors

The Worthington Angle Gas Engine Compressor line, comprising five sizes with from three to eight cylinders, is the most complete available and represents the latest type of compressing units. Incorporating features which ensure a maximum of performance satisfaction, they are built to meet the active demand for self-powered, compact compressing units for refrigeration, gas and air—for use wherever fuel gas is available. Their great flexibility in operation, small floor space requirements and low installation cost make them the favored equipment for repressuring and recycling plants, natural gasoline plants, oil refineries and refrigeration. They are also especially suited to gas transportation and distribution service, gas processing and general air supply.

Each unit consists of a combination of a Worthington high-efficiency compressor element and a vertical gas engine, all integrally built into one compact and rugged structure.



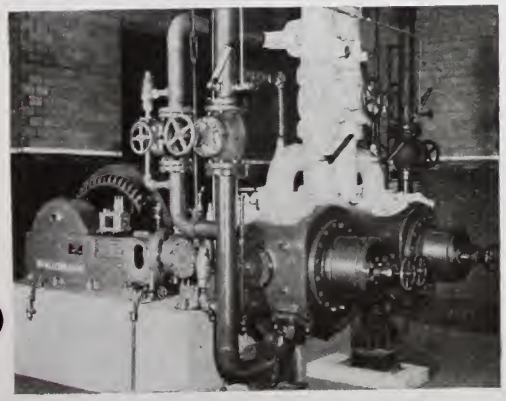
Worthington Angle Two-Cycle Gas Engine
Propane Refrigeration Compressors

CONSTRUCTION

Engines are the straight line vertical type, conservatively rated, with maximum accessibility and with the smoothest operating balance. A full force-feed system delivers oil to all parts of the running gear, while individual cylinder walls are lubricated by an independent mechanical force-feed lubricator. Large water jacket area is provided for the power cylinders and the extra large diameter crankshaft ensures stiffness and gives large diameter bearings and pins for the running gear.

Each unit has from one to four compressor cylinders, depending on the size, and may be single or multi-stage as required. Efficient and durable Worthington Feather Valves are used. The compressor element may be arranged to deliver any combination of volume and pressure within the limits of engine rating and with this flexibility it is possible to meet service conditions of widely different character.

All types of capacity controls used with this style of compressor cylinder are available, in addition to the regular speed variation provided on the engine.



Worthington Horizontal Ammonia Booster
Compressor (Motor Drive)

Booster Refrigeration Compressors

Worthington Booster Refrigeration Compressors of the horizontal double acting type are built in a full range of sizes for applications in conjunction with either compression or absorption systems where low temperature conditions are desired.

Individual Bulletins, describing in greater detail the various types of Worthington Refrigeration Compressors and Worthington Engine Drives are available on request.

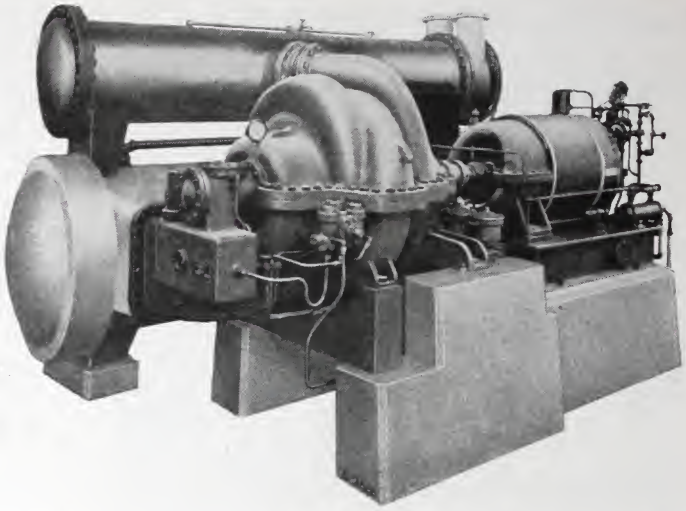
CENTRIFUGAL REFRIGERATION

Liquid Cooling Systems 150 to 2600 Tons Capacity

Worthington Centrifugal Refrigeration was introduced in 1939, and has since gained widespread acceptance. Many thousands of tons capacity are now contributing to industrial production in the manufacture of pharmaceuticals, synthetic rubber and tires and aviation gasoline, in addition to the more widely known comfort air conditioning field. Designed and manufactured in its entirety in our own plants, Worthington offers undivided responsibility for dependable performance.

A Worthington Centrifugal Refrigeration System consists of three basic component parts: (1) a three-stage compressor; (2) a water-cooled condenser; and (3) a horizontal shell and tube cooler of special design.

The complete unit is compact—yet arranged to provide ready access to all operating parts for inspection and maintenance.



450-TR Condensing Steam Turbine Driven Centrifugal Refrigeration Unit

CAPACITIES

150 to 2600 tons . . . sizes of Worthington Centrifugal Refrigeration Systems insure efficient and economical operation in a wide range of installations.

PERFORMANCE

Unusual features of Worthington design make possible: *Lower Power Input* per ton of refrigeration; *Great Flexibility* in capacity; *Smooth Operation* . . . having no reciprocating parts; *Inherent Stability* of operation at all speeds and through the entire range of capacity; *Light and Compact* . . . requiring no costly foundations. These all contribute to *Lower Cost of Operation and Maintenance.*

APPLICATIONS

Adaptability of these units allows widespread application.

These units, while finding their primary application in the air conditioning field, are also used for many industrial applications.

Chilling water for air conditioning; chilling brine for industrial processes; cooling liquid chemicals, lubricating oils and other hydrocarbons are but a few of the many uses for this versatile equipment.

CONSTRUCTION

Compressors: These are all of three-stage design. Impellers of rust-resisting cast alloy steel are mounted on a common shaft, also of alloy steel. Impeller and shaft assembly are both statically and dynamically balanced.

Refrigerant: Designed for operation with Freon or hydro-carbon refrigerants.

Shaft Seal: An oil seal prevents refrigerant leakage or air infiltration during operation. A mechanical seal performs this duty during shutoff periods.

Dual Lubrication: During operation, lubrication is provided by a gear pump, driven from the compressor shaft. An auxiliary motor-driven hermetically-sealed gear pump, provides oil under pressure to the seal and all bearings prior to and during the start-up period, and while the compressor is decelerating.

Evacuation Devices: Automatically operated equipment provides for positive removal of non-condensable gases and moisture from the system, with efficient refrigerant recovery.

Drivers: The centrifugal compressor is designed for electric motor drive of the synchronous, slip ring, or squirrel cage type, or for steam turbine drive.

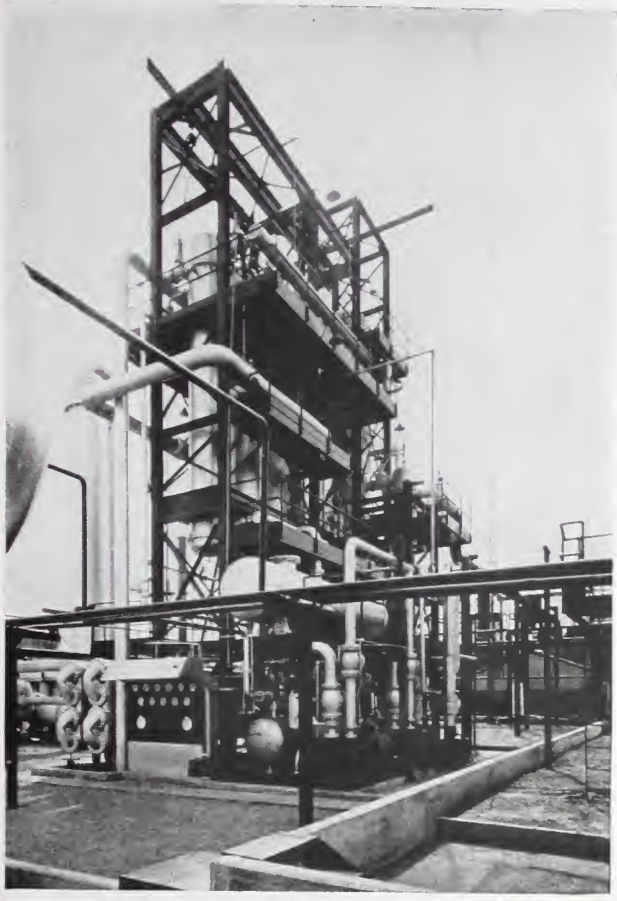
Liquid Sub-cooler: All machines have as standard equipment an intermediate liquid refrigerant sub-cooler to provide greater efficiency for the entire refrigerating cycle.

Cooler and Condenser: The design of these parts incorporates a liberal amount of heat transfer surface, consisting of special, non-ferrous replaceable finned tubes of high heat transfer efficiency.

Instrument Panel: Carries pressure gauges, pressure switches, safety switches, operating indicator lamp, and push button stations for auxiliary equipment.

ABSORPTION REFRIGERATING MACHINES

From 10 to 1000 Tons Capacity



700 Ton Ammonia Absorption Machine Installed in Large Refinery

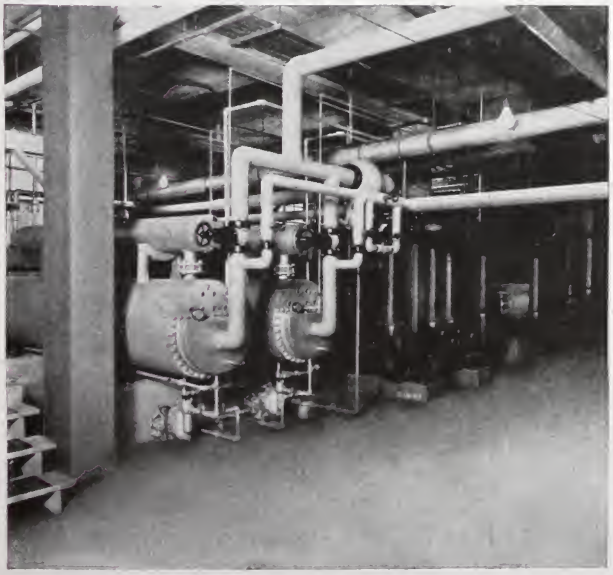
Worthington Absorption Refrigerating Machines, utilizing exhaust or live steam, or other sources of available heat in the generator, are built in sizes up to 1,000 tons or larger, in a single unit.

In the smaller sizes, rectification—or drying—of the ammonia gas to the condenser is usually by means of a water-cooled rectifier; in the larger units this is accomplished in a fractionator, or bubble-type column, by means of anhydrous ammonia reflux. Moisture in this ammonia-vapor stream is thereby reduced to .05% or less—a controlling factor in maintaining efficient operation.

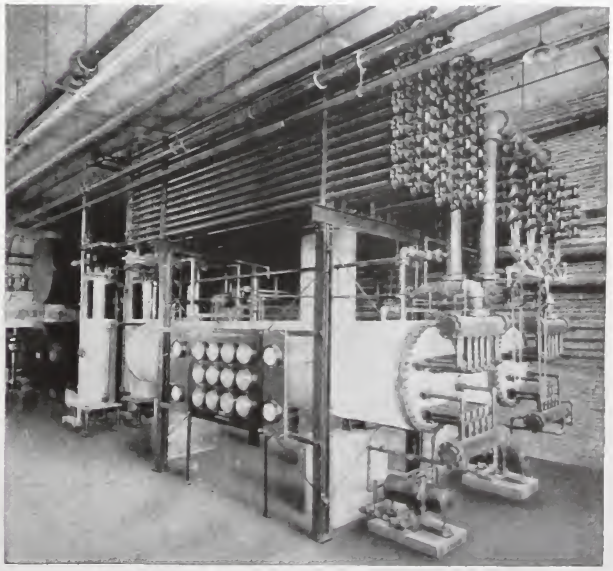
Absorption Refrigerating Machines of small or medium capacity are designed so that the several parts may be grouped together or separately placed in convenient available spaces, making layout of the equipment flexible enough to suit almost any type of location, inside or outside of a building. Larger units are designed for out-of-door installation. Compact in arrangement, they require a minimum of ground space, and are constructed in such a manner that no cover is needed.

The only moving parts of the absorption refrigerating machine are the ammonia pumps, which may be either centrifugal or positive-displacement, depending on the type best suited to the plant conditions, and may be direct-steam-, steam-turbine-, or motor-driven, as required.

Controls for maintaining correctly proportioned flow of vapor and liquid through the system may be fully automatic, resulting in operation that requires a minimum of attention.



Tubular Generators and Rectifiers
Part of Absorption Machine Installed in Basement of a Hospital



Double Pipe Absorption Machine with Shell and Coil Type Generator

EVAPORATIVE CONDENSERS AND COOLERS

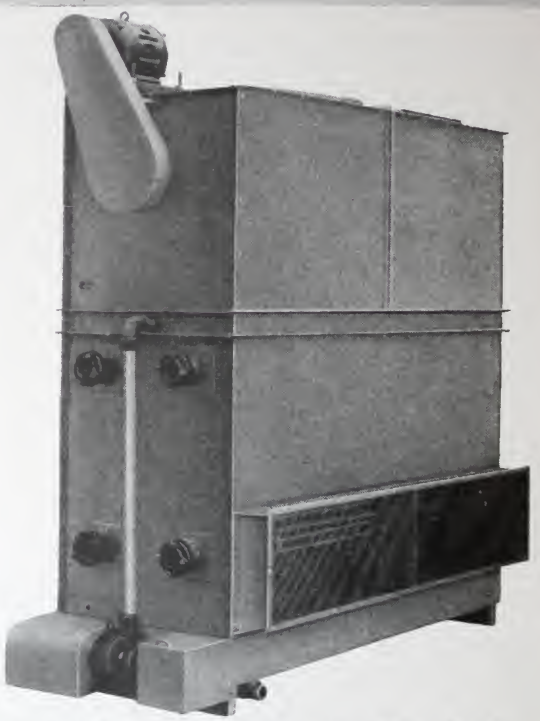
Series EC—for Liquid Cooling in Closed Systems

Features—Series SC

- Reduces water consumption 90% or more.
- Increases compressor capacity . . . decreases power required.
- Eliminates need for new and expensive water service facilities.
- Modernizes existing water-cooled installations.
- Replaces existing cooling towers . . . saves space . . . reduces cost of operation . . . improves appearance . . . saves water . . . eliminates line losses and lowers pumping costs.
- Compact—Uses minimum floor space . . . may be installed inside or outside . . . in basement or on roof.

Unit No. for Freon 12	Nominal Capacity* Tons	Dimensions in Inches		
		Length	Width	Height
16C-4	11.0	57	32 1/8	100 3/8
18C-4	12.1	57	32 1/8	100 3/8
26C-4	22.1	86	32 1/8	102 3/8
28C-4	24.2	86	32 1/8	102 3/8
36C-4	31.9	98	38 5/8	110 7/8
38C-4	34.8	98	38 5/8	110 7/8
46C-4	41.0	105	45 1/8	119 7/8
48C-4	44.9	105	45 1/8	119 7/8
56C-4	50.0	110	52 1/8	128 7/8
58C-4	55.0	110	52 1/8	128 7/8

*Nominal Tons for Freon-12, based on 78° F. W.B. entering air, 40° F. evaporating and 105° F. condensing temperatures.



Series SC—for Freon-12, Methyl Chloride and Ammonia

Additional Features—Series EC

- Provides closed circuit for jacket water.
- Increases life and efficiency of connected equipment, safeguarding investment, performance.
- Through reduced heating of oil in transformer, increases efficiency.
- Quenching oil may be maintained at desired temperature.
- When lubricating, oil cooling is desired in addition to jacket water cooling for a Diesel engine, a special coil can be provided for this service. This coil is mounted below the water coil.

Unit Number	Maximum Engine Rating in Hp.		Capacity in BTU. per Minute	G.P.M. Jacket Water	Air Volume C.F.M.	Spray Water G.P.M.
	Diesel	Gas				
112EC-12	120	90	6,000	36	2,400	18
116EC-16	157	118	7,830	47	2,400	18
120EC-20	190	143	9,500	57	2,400	18
124EC-24	234	175	11,680	70	2,400	18
216EC-8	317	237	15,825	95	4,800	28
220EC-10	400	300	20,000	120	4,800	28
224EC-12	466	350	23,300	140	4,800	28
316EC-8	515	388	25,800	155	7,200	43
320EC-10	630	472	31,500	189	7,200	43
324EC-12	700	525	35,000	210	7,200	43
420EC-10	833	625	41,600	250	9,500	54
424EC-12	924	692	46,100	277	9,500	54
520EC-10	1020	763	50,800	305	11,600	65
524EC-12	1125	844	56,250	337	11,600	65

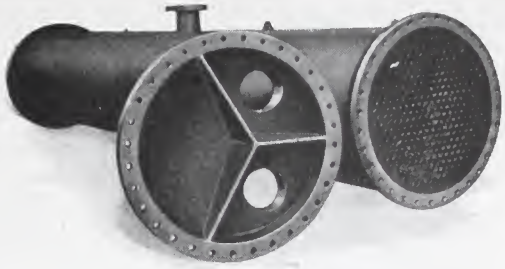
Capacities are based on cooling water from 140° F. to 120° F. with air at 75° F. Wet Bulb Temperature.

CONDENSERS AND COOLERS

Shell and Tube Type for all Refrigerants

The development of the shell and tube type condenser and cooler to a point of highest efficiency and economy is another striking example of the numerous major contributions which Worthington has made to the air conditioning and refrigeration field.

The materials used are the best procurable and are specified in accordance with the standards developed for the service. Steel plates are used in all shells and tube sheets. Exceptionally heavy tube sheets are welded to the shells which provide ample strength to resist tube rolling stresses and assure tightness. The tube holes are carefully reamed and have two annular grooves forming a triple seal into which the tubes are rolled. See illustration in lower right. This construction ensures leak-proof joints.



Large Multi-pass Condenser with typical head showing baffles

Multi-pass Condensers and Coolers

The chief advantages possessed by horizontal multi-pass tubular-type condensers and coolers are: (1) low head room required; (2) comparatively small floor space: (3) ease of cleaning; (4) high efficiency.

To produce the high liquid velocity necessary for rapid and efficient heat transfer, the heads are efficiently baffled.

Small Multi-pass Condenser

Small Multi-pass Condensers and Coolers

To fill the demand for small but efficient condensers and coolers, multi-pass designs are available ranging in capacity from about 1 ton refrigeration upward. Construction details are essentially the same as for the larger units.

Non-priming Brine Coolers

When specified, coolers can be furnished in which the shells are not entirely filled with tubes leaving ample space at the top for gas and liquid separation. Such coolers have an application where loads vary considerably and are subject to sudden and severe increases.

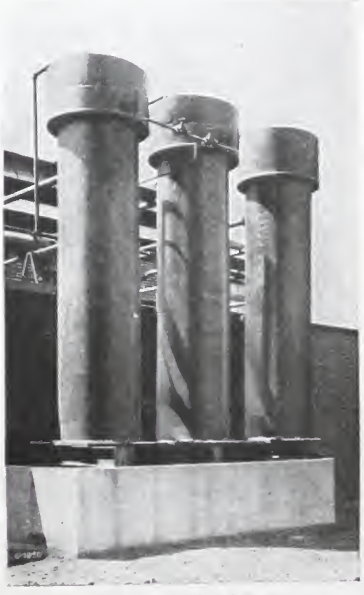
Ice Tank Coolers

Single pass ice tank coolers in which the baffled heads are eliminated, permits a greater number of tubes to be used in a given diameter of shell.

"Spira-Flo" Vertical Condensers

Worthington "Spira-Flo" condensers are provided with a circular water box and special water distributors having a number of angle slots designed to give a spiral motion to the water as it passes downward through the tubes. These distributors are easily removable for cleaning without interfering with the operation of the condenser. Otherwise, construction is practically the same as that of the multi-pass types . . . steel shells, heavy tube sheets electric-welded to the shell, and grooved triple-seat leakless tube joints.

The section at the right shows the method of water distribution in the "Spira-Flo" Condenser. The action of the water draws air down through the center of the tube, thereby causing an evaporative effect similar to that in an atmospheric condenser.



"Spira-Flo" Condensers

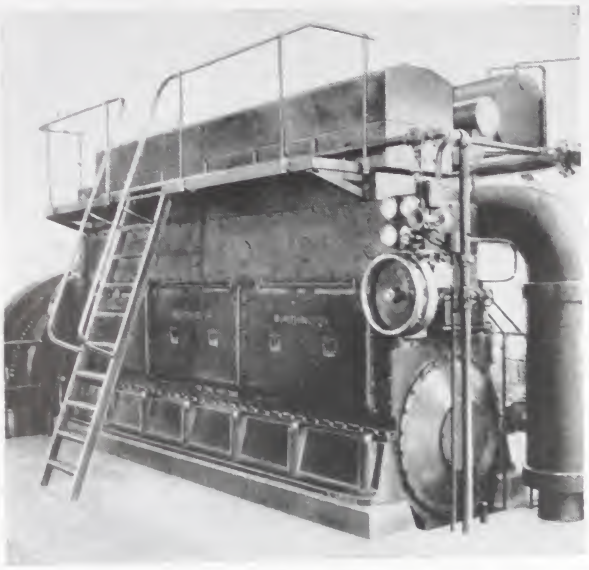
FEATURES

This condenser possesses many important advantages not found in other types:

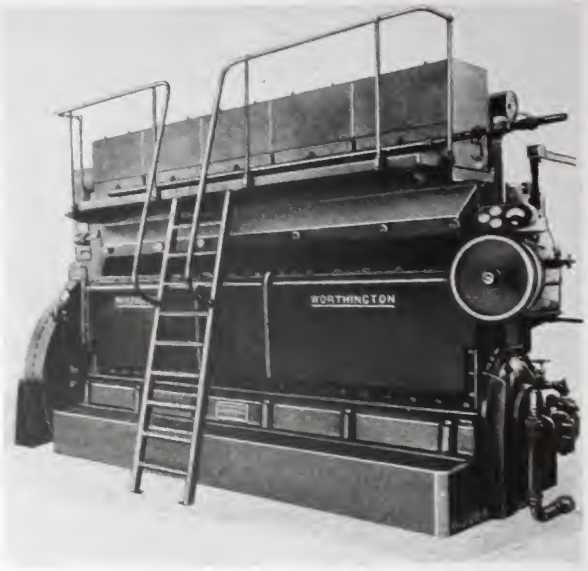
- Can be cleaned while in operation.
- Brings the head pressure very close to the limits set by the water temperature.
- Occupies much less floor space than most other types of condensers.
- Can be used with any kind of water.
- Can be placed indoors or outdoors or on the roof.

"Spira-Flo" Distributors

DIESEL, GAS, AND CONVERTIBLE ENGINES



Type EH or EHG



Type DD or DDG

Worthington vertical, four-cycle, Diesel and gas engines for generator or equipment drives are built in capacities to meet practically every requirement. They are all of slow or medium speed and of heavy duty construction, and each installation is individually engineered for its particular needs.

VERTICAL DIESEL ENGINES

TYPE BB—5 and 6 cylinders, 150 and 180 hp. at 600 rpm.
TYPE CC—4 to 8 cylinders, 240 to 480 hp. at 450 rpm.
TYPE SCC—5 to 8 cylinders, 420 to 675 hp. at 450 rpm.
TYPE DD—5 to 8 cylinders, 453 to 730 hp. at 375 rpm.
TYPE SDD—5 to 8 cylinders, 645 to 1040 hp. at 375 rpm.
TYPE EH—5 to 12 cylinders, 720 to 1720 hp. at 360 rpm.
TYPE SEH—5 to 16 cylinders, 1030 to 3290 hp. at 360 rpm.

VERTICAL GAS ENGINES

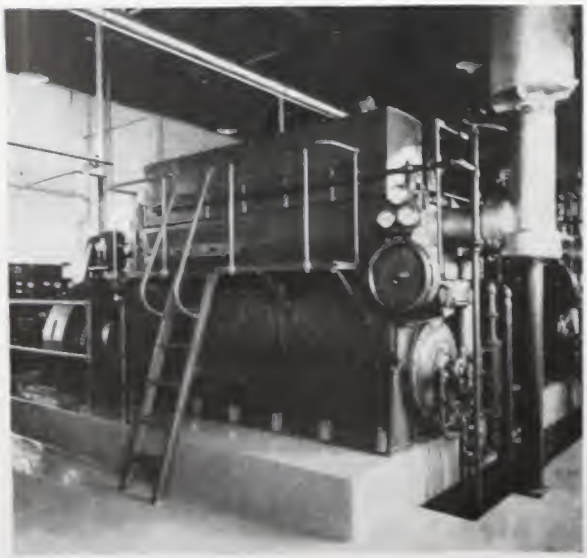
TYPE BBG—5 and 6 cylinders, 175 and 210 hp. at 600 rpm.
TYPE CCG—4 to 8 cylinders, 265 to 535 hp. at 450 rpm.
TYPE DDG—5 to 8 cylinders, 520 to 835 hp. at 375 rpm.
TYPE EHG—5 to 16 cylinders, 715 to 2300 hp. at 360 rpm.

CONVERTIBLE DIESEL-GAS ENGINES

Any of these engines may be arranged for ready conversion from Diesel to gas or from gas to Diesel. With these units this is a simple operation which can be accomplished during overnight or week-end shutdown periods.

Starting air compressors, circulating water pumps, meters, generators and other auxiliary engine equipment are also built by Worthington.

Type CC or CCG



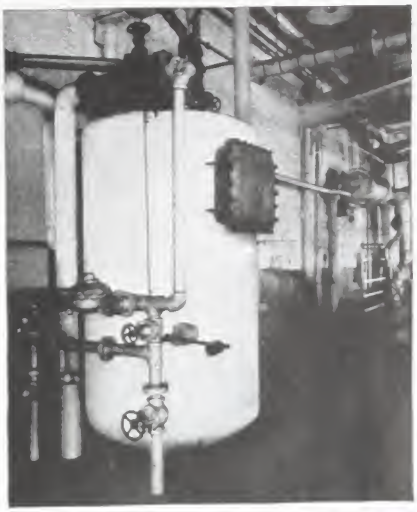
Type BB or BBG

DEAERATORS AND DEAERATING HEATERS

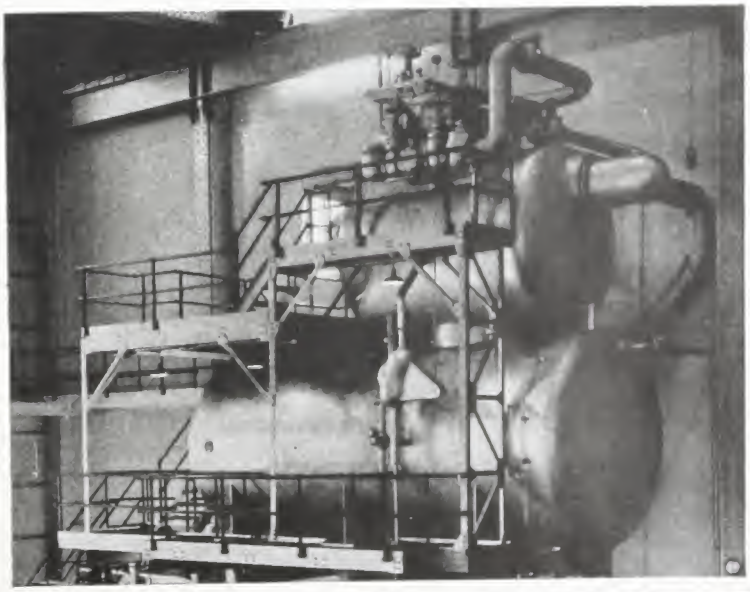
For Removing Oxygen from Boiler Feed Water

A background of experience, now approaching the half-century mark, in the design and manufacture of heaters and heat transfer equipment enables Worthington to provide deaerating equipment which is efficient in operation, accessible for maintenance, and adaptable to the most exacting service conditions and limited space requirements.

This equipment can be furnished for any capacity in the following types: pressure, vacuum, pressure-vacuum, metering and storage. Units may be horizontal or vertical, with single or double shells. Typical installations are shown on this page.

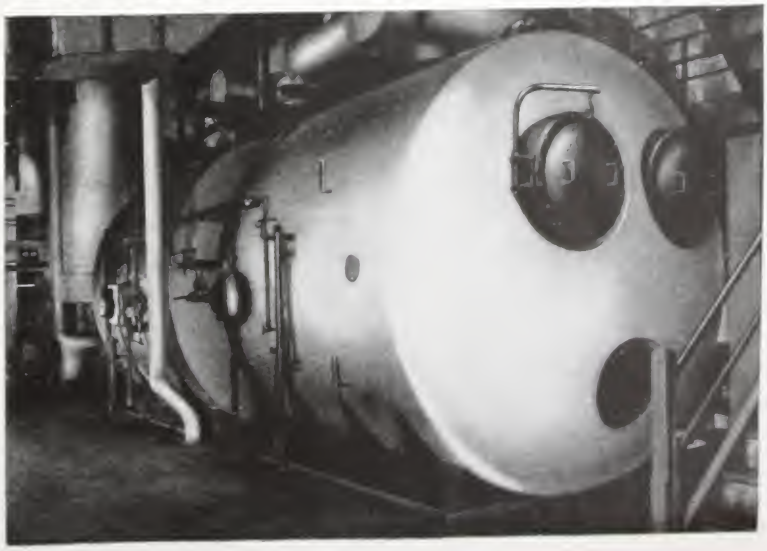


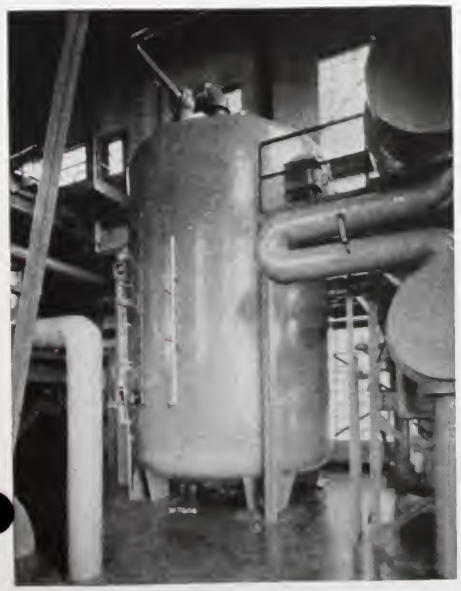
Upper Right—100,000-lb. Vertical Deaerator, furnishing deaerated water for boilers of a New England textile mill



Center Right—400,000-lb. Two-section Storage Type Deaerator for pressure-vacuum service. Installed in the power plant of a prominent utility, this unit not only furnishes oxygen-free water but affords large storage reservoir in the boiler feed system

Lower Right—Two 650,000-lb. Horizontal Deaerators of the single shell type. These units are so arranged that they may be used singly or in parallel operation





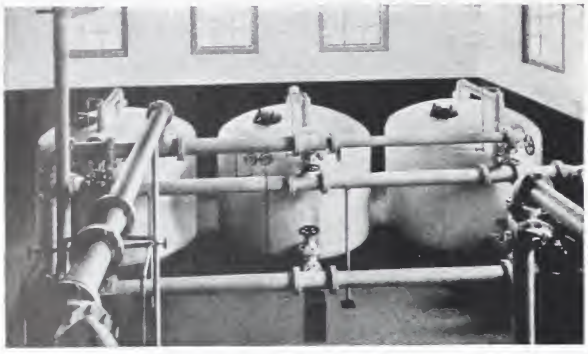
400,000-lb. Vertical Storage Deaerator for pressure-vacuum service for deaeration of feedwater

PRESSURE FILTERS

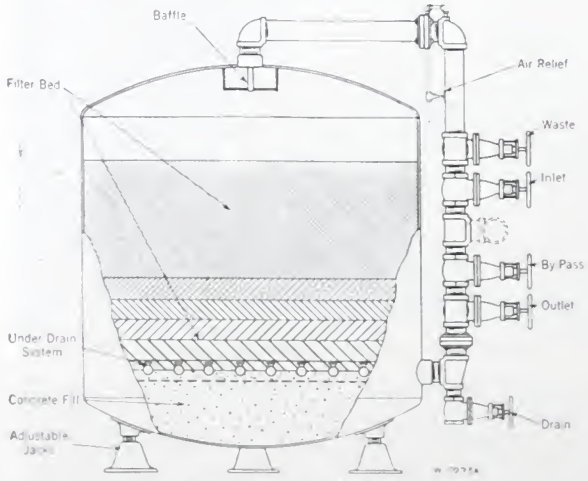
For Water Purifications

Worthington Pressure Filters provide a practical and positive method for removing suspended matter from water to be used for drinking, swimming, or industrial processes.

The filtering medium used is sand, selected from natural sources. When processed, the resulting product consists of grains closely approaching roundness and composed of practically pure silica. The rounded shape of the sand grains provides uniform density and the hardness and wearing qualities of silica provide long life.



Battery of three Pressure Filters. Capacity 350 Gpm.



Section of typical Worthington Filter Design

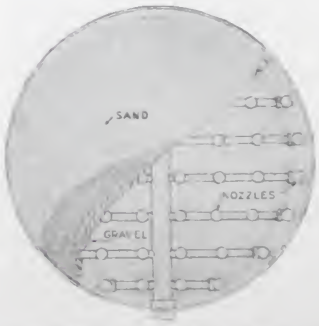


Illustration of underdrain system viewed from above with portion of filter bed removed

Distribution Nozzle . . . protects openings in underdrain system

A layer of this filter sand is supported by layers of silica gravel of proper lump shape and sizes in suitable arrangement to provide efficient hydraulic conditions, and the whole is called the filter bed. Where the temperature and/or chemical character of the water may induce dissolution of the silica and where even a slight trace of dissolved silica in the filtered water may be objectionable, *Carbworth*, a scientifically prepared granular carbon is furnished instead of sand and gravel. The filter bed is contained within a steel shell, designed to safely withstand the working pressure of the water system to which it is connected.

As shown in the sectional drawing below, unfiltered water enters at the top of the unit, is forced evenly through the filter bed with a minimum drop in pressure, and emerges at the bottom through a special collector system, free from suspended material. Accumulated suspended matter is periodically washed out of the system by reversing the flow and discharging to waste. For certain conditions, an efficient compressed air wash system is available.

The Worthington Filter is designed to filter under pressure so that the utmost supply pressure remains available for delivering the filtered water to the point of use. For planning the installation with suitable factor of safety, experience indicates that ten pounds pressure loss is a generous allotment for the filter, filter piping, and friction of the suspended impurities.

Capacities of Worthington Pressure Filters are based on the gallons of water per minute which pass through a given square foot area comprising the top surface of the filter bed. For very conservative practice a rating of one gallon per minute per square foot of bed area is used. The rate for different requirements varies up to four gallons. Data in the table below is based on a three gallon rate. All capacities should be figured in gallons per minute, as this time unit is sufficiently small to include any maximum demand which is likely to be made upon the filter.

Note: Color, taste, odor, or dissolved impurities are removed by systems other than sand filtration, although sand filtration usually comprises a necessary feature of such systems.

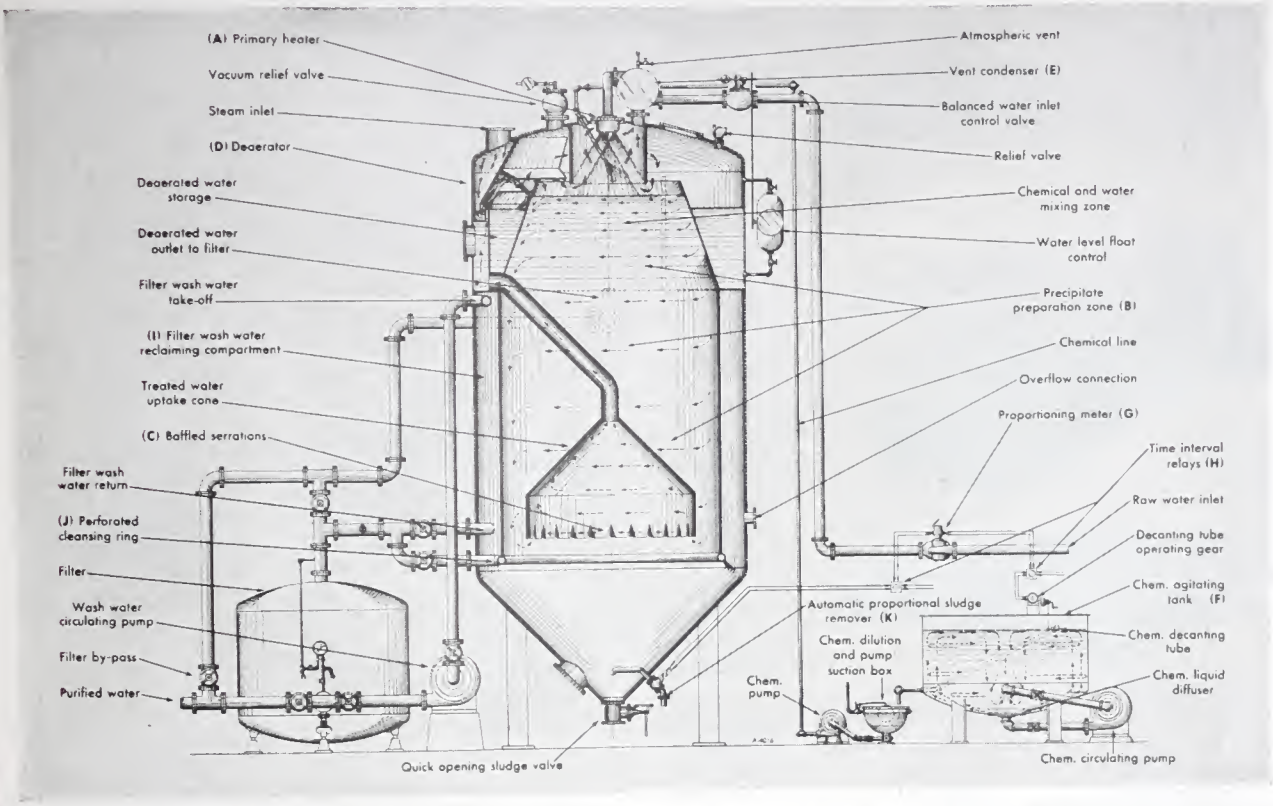
CAPACITIES, SIZES, WEIGHTS

Capacity* Gpm.	Size			Diameter of inlet	Shipping Weight lb. per filter
	Diam.	Length†	Height†		
37.8	4'0"		6'6"	2½"	5,200
47.7	4'6"		6'9"	3"	6,600
58.8	5'0"		6'10"	3"	8,200
84.9	6'0"		7'3"	3½"	11,700
115.5	7'0"		7'6"	4"	16,400
150.6	8'0"		7'9"	5"	21,700
194.4	9'0"		8'2"	5"	28,500
240.0	10'0"		8'6"	6"	34,500
270.0	8'0"	12'0"		6"	43,000
360.0	8'0"	16'0"		8"	56,000
450.0	8'0"	20'0"		8"	71,000
540.0	8'0"	24'0"		10"	84,000

* Worthington Pressure Filters are made in 31 capacities, from 2.4 to 564 Gpm. Only 12 sizes are listed above.
† Sizes up to and including 240 Gpm. capacity are vertical type. Larger sizes are horizontal type.

HOT PROCESS WATER SOFTENERS

For Boiler Feedwater Purification



Scaling and corrosion difficulties in power plant boilers are eliminated by Worthington's water purification systems which include the Hot Process Deaerating Type Softener illustrated by the above drawing.

The closed arrows show how the entering steam contacts the incoming raw water in Primary heater (A), raising it to practically steam temperature, and passes on to supply the Deaerator (D), where the water is raised to deaerating temperature, thence to the Vent condenser (E) where the oxygen is discharged from the system, and the remaining steam recovered as condensate.

The open arrows indicate the path of the incoming raw water which travels thru the Vent condenser (E), is heated in the Primary heater (A), and receives its chemicals at the top surface of the water in the Reaction-settling chamber.

The Primary heater spray valves deliver the water at an angle which imparts a rotary motion to the water under treatment thereby uniformly dispersing the chemicals and providing the longest possible travel thru the Precipitate preparation zone (B) for preparing the chemically precipitated impurities for the most efficient separation and final removal as sludge.

An even downward draft is assured by the Uptake cone's Baffled serrations (C), the baffles serving the dual purpose of preventing turbulence within the cone, and the continuance therein of the desirable rotating motion.

That a large percentage of the water passes thru the serrations will be apparent when it is considered the non-circulating water below the cone is cooler and hence denser than the water which continuously travels above it.

A filter is provided for final clarification. That the filter may be cleansed by backwashing without disturbing the treating process, or damaging the filter by application of any but clean chemically inert backwash water, a Filter wash water reclaiming compartment (I) is provided. The water in this compartment is used over and over again, quickly settling clean after each backwashing operation, the sediment passing out thru the Automatic proportional sludge remover (K).

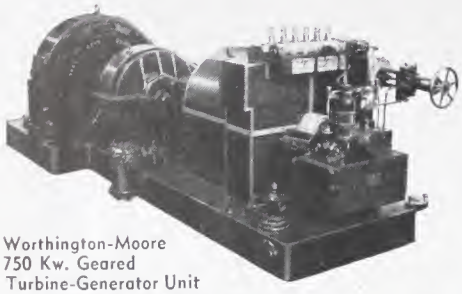
The chemicals are supplied from the Chemical agitating tank (F) which is unique in that the agitation is provided by circulating the chemical mixture thru a diffuser, thereby maintaining superior uniformity without the use of submerged moving parts.

Proportioning meter (G), working in conjunction with a Time interval relay (H), causes the lowering of a decanting tube thru increments that are in exact proportion to the flow of raw water to the system, so that the chemical liquid is decanted and delivered to the softener in exact accord with the water treating requirements.

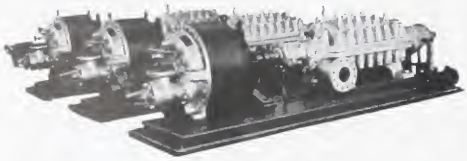
WORTHINGTON-MOORE STEAM TURBINES

Turbine Generator Units—Reducing and Increasing Gears

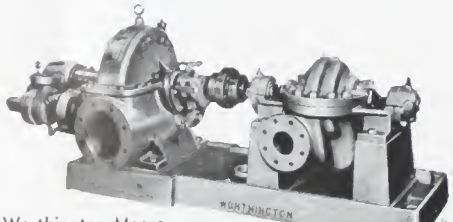
Worthington-Moore 4000 Kw. Direct Connected Turbine-Generator Unit



Worthington-Moore 750 Kw. Geared Turbine-Generator Unit

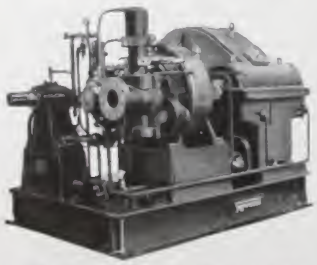


Three Worthington-Moore 700 Hp. Multi-stage Steam Turbines Driving Boiler Feed Pumps



Worthington-Moore Single Stage Turbine Driving Worthington Boiler Feed Pump

Worthington-Moore Combined Turbine and Gear for "V" Belt Drive



Worthington-Moore Double End Geared Turbine with Variable Speed Governor

Turbine Generator Units

Worthington-Moore turbine generator units are built in sizes up to 7500 kw. and are available in all types, such as straight condensing, straight non-condensing, bleeder, mixed pressure, mixed pressure bleeder, low pressure, and high back pressure. Each unit is designed to best suit the conditions under which it will operate.

Both direct connected and geared alternating and direct current units are available.

Automatic nozzle control is always supplied on large units and is available on the smaller turbines where good economy is desired under varying loads.

Multi-stage Turbines

Worthington-Moore multi-stage turbines are built in sizes from 25 to 10,000 Hp. They give better economy and longer blade life than single stage turbines, especially at moderate or low speeds.

These turbines are also built in all types and can be used for any turbine duty where an economical and reliable unit is desired.

Single Stage Turbines

Worthington-Moore single stage steam turbines are built in sizes up to 1500 Hp. They are especially adapted for driving boiler feed pumps, forced and induced draft fans, coal pulverizers, and other auxiliaries where simplicity of construction and reliability are of prime importance.

Combined Turbine and Gear

Worthington-Moore combined turbine and reduction gear units are built in sizes from 5 to 200 Hp. This arrangement permits economical turbine operation when driving slow speed machines and is a compact, sturdy, reliable unit. This type unit is especially suited for driving moderate speed auxiliaries where low steam consumption is necessary.

Variable Speed Governors

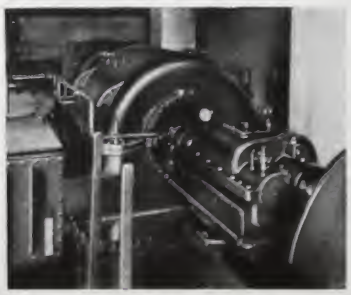
Variable speed hydraulic governors can be supplied, by means of which the speed of the turbine may be varied over a wide range while the turbine is in operation. These governors can be set at any desired speed over a broad range. They can be arranged for remote control.

Reducing and Increasing Gears

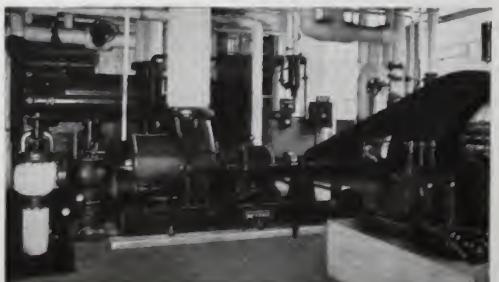
Worthington-Moore double helical gears are designed with low tooth pressure, have no end thrust and are automatically lubricated both at the bearings and at the line of tooth contact.

Special Applications

We build Steam Turbines to meet unusual operating conditions involving special governing requirements. Also low pressure turbines to operate on exhaust steam from existing engines. The unit shown below at right takes in steam at 5 lb. pressure and exhausts to a condenser at 26" vacuum.



Motor Driven Centrifugal Compressor Connected through Worthington-Moore Speed Increasing Gears



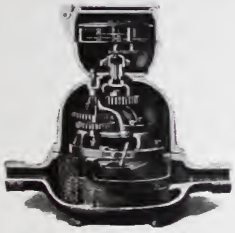
Worthington-Moore Geared Turbine Driving Reciprocating Compressor through "V" Belts

LIQUID METERS

For Cold Water, Hot Water and Petroleum Products

For over 80 years **WORTHINGTON-GAMON METERS** have been proving their accuracy and dependability for hundreds of municipalities, water companies and consumers. Valuable fuel and crude oils, condensate returns, boiler feedwater and many other liquids are also being measured by these meters with the same unchanging accuracy. All sizes and types of Worthington-Gamon cold water meters comply with the standard specifications adopted by the American and New England Water Works Associations.

Disc Type Meters



Split Case Disc Meter with open gear train

3" and 4" Size Disc Meter

Maximum accuracy, long life and less maintenance are three good reasons for the universal preference for the disc meter for most cold water applications. This type meter is also used in hot water measuring service. In addition to the usual advantages of this design—absence of wearing parts, constant accuracy of the nutating disc, and freedom from stickage and stoppage—"Watch Dog" disc meters possess exclusive features which contribute greatly to their dependability. A patented construction eliminates stuffing box leakage completely. The extension of the diaphragm beyond the walls of the port which it divides eliminates slippage and brings the limits of registration closer together.

All sizes are available with open gear train. Sizes 5/8" to 2" inclusive may be equipped with oil and graphite packed enclosed gear train. May have either round or straight reading registers. Casings, gears, shafts and pinions are of high grade bronze. Dial is of over-glazed enamel on copper back. Frostproof models are available in 5/8", 3/4" and 1" sizes.

Size in.	Max. Cap.† Gpm.	Overall Dimensions-inches Length	Width	Height	Connection	Net Weight lbs.
SPLIT CASE MODELS						
5/8	20	7 1/2	4 3/4	7 1/4	Threaded	10
3/4	34	9	6 1/2	7 3/4	Threaded	13
1	53	10 3/4	7 3/4	8 1/4	Threaded	20
1 1/2	100	12 5/8	11	9 3/4	*	43
2	160	15 1/4	12 3/4	10 1/2	*	57
3	315	24	15 1/2	14	Flanged	120
4	500	29	21 3/4	16 1/2	Flanged	310
FROST PROOF MODELS						
5/8	20	7 1/2	5 3/8	8	Threaded	10 1/2
3/4	34	9	6	8 1/2	Threaded	13
1	53	10 3/4	8 1/2	9 1/2	Threaded	21

* Either tapped or oval flanged connections available.
† For cold water. In hot water service capacities are one-third these quantities. Capacities for other liquids depend upon viscosity, lubricating properties and pressure. Additional data will be furnished upon request.

Turbine (Current) Meters

Type IH for Cold Water—100° F. at 150 Psi.
Type HHL for Hot Water—200° F. at 125 Psi.
Type HH for Hot Water—250° F. at 250 Psi.

The Worthington-Gamon Turbine Meter is used extensively for services where large volumes of water are used more or less constantly and where extreme accuracy on small flows is not required.

Type IH Turbine Meter

Water, flowing on both sides of a double wheel with two sets of vanes, actuates the register, and due to the absolute water balance secured, there is no end thrust or wear. The volute pattern chamber reduces friction losses by avoiding sudden changes in the direction of the flow.

These meters are sensitive, accurate and unusually durable. When used to measure feedwater, they may be absolutely depended upon for a continuous record of boiler performance.

Compound Water Meters

For Cold Water Service Only

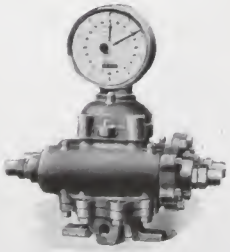
The Worthington-Gamon Compound Meter consists of a standard "Watch Dog" positive disc displacement meter, a standard current meter, and an exclusive design of compounding valve. It records accurately the entire range of flow through large service pipes from the smallest trickle to full demand.

Compound meters are of bronze construction throughout and gear trains may be either oil enclosed or open type.

Size in.	Max. Cap. Gpm.	Overall Dimensions inches Length	Width	Height	Net Weight lbs.
2	160	21	10	16 3/4	140
3	315	25 3/4	12	18 1/2	186
4	500	29 3/4	14 1/2	21 1/2	275
6	1000	36	18	25 1/2	480
8	1600	42	21	32	760

Duplex Piston Oil Meters

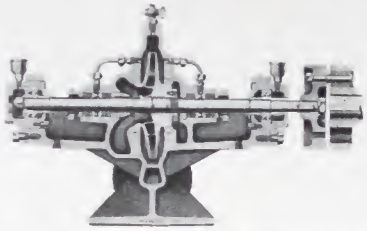
The Worthington-Gamon Duplex Piston Meter is essentially the water end of a duplex double-acting pump. Moving parts consist of two plungers and two slide valves, with a lever which conveys the motion of the plunger to the recording mechanism.



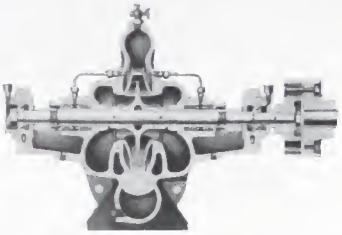
Piston Meter with Vertical Register

This meter is highly recommended for crude and fuel oils on burner service. It can be calibrated to meet varying conditions of service by screwing in or out the adjustable bronze tappets on the ends of the cylinders to vary the length of the stroke.

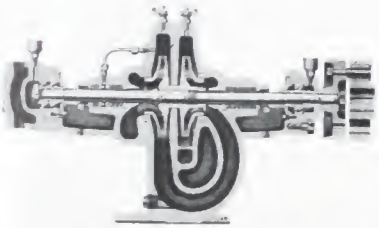
Maximum pressure for oil service is 250 Psi. for all sizes except the 3", which is 175 Psi. Maximum capacities vary from 10 to 100 Gpm. of light fuel oil, depending on the size.



Type R—Single Stage Volute Pump with single suction enclosed bronze impeller, hydraulically balanced



Type L—Single Stage Volute Pump with double suction enclosed bronze impeller



Type U—Two Stage Volute Pump with two enclosed bronze impellers cast in one piece and hydraulically balanced

Centrifugal Pumps Type R, L and U Single and Two Stage *(At left)*

With over 100 years of pump engineering experience, Worthington has developed a comprehensive line for every standard service and for many special applications. Shown here are three general service pumps—Types R, L and U—suitable for many building services and air conditioning applications.

Casings give a smooth flow with gradual velocity changes. They are split horizontally, giving access to the interior without disturbing the piping. Impellers are bronze, keyed to a heat treated steel shaft accurately ground to dimensions and polished to a smooth surface. Ball bearings are used throughout. Stuffing boxes are of extra depth and contain a water seal cage. Pumps are normally supplied base mounted with motor. Other types of drives or special bases are available.

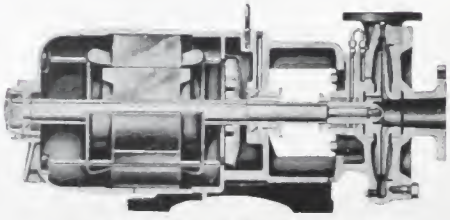
Capacities of these pumps range up to 2000 Gpm. and heads up to 550 feet.

Balanced Monobloc Centrifugal Pumps *(Below)*

A compact, sturdily built unit of pump and motor for general water service including house pumps, cooling towers, small boiler feed, hot and cold water circulation, brine circulation.

Monobloc pumps are built as single and two stage in standard fitted, all iron or all bronze. Single suction enclosed impellers, hydraulically balanced to eliminate end thrust, are keyed to shaft and held with a special locknut to prevent leakage along the shaft. Stuffing boxes on size 1-D-5 and larger are specially designed for water seal.

Capacities up to 1600 Gpm. with heads up to 500 feet are available with Balanced Monobloc Centrifugal Pumps.



Section of typical Monobloc Pump

Section of typical Monobloc Two-Stage Pump

Vertical Monobloc Centrifugal Pumps

FLANGED PUMPS

Long Model

Short Model

Worthington Vertical Monobloc Centrifugal Circulating Pumps are available for capacities to 60 Gpm. and heads to 70 feet.

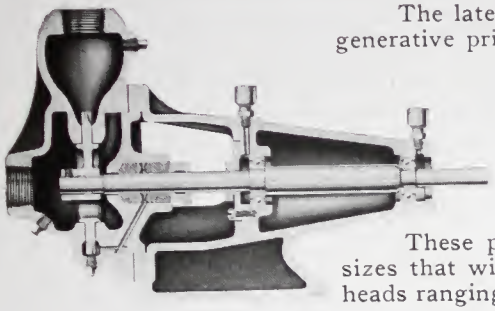
These easily installed pumps are widely used for general circulating services.

IMMERSED PUMPS

Short Model

Long Model

REGENERATIVE TURBINE PUMPS



The latest and most modern concepts of the regenerative principle are incorporated into the rugged design of all Worthington Regenerative Turbine Pumps which are being used for general water, cooling tower, small boiler-feed, and condensate services, circulation and washing systems, sanitary water supply, and gasoline and volatile liquid services.

These pumps are available in a large range of sizes that will handle capacities up to 70 Gpm. and heads ranging to 460 feet.

VERTICAL TURBINE PUMPS

WATER OR OIL LUBRICATED

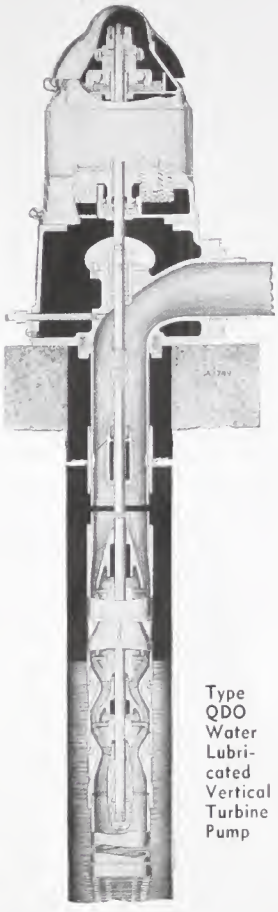
For: Air Conditioning Water Supply, General Water Supply, Airport Fueling Systems, Irrigation, Drainage, Cofferdams, Mine Sinking, Mine Stations, Construction Dewatering, Condenser Circulation, Liquid Cargo Unloading, Salt Brine, Floating Dry Docks, Process Circulating, Bulk Liquid Transfer.

Type QBE or QDE is oil lubricated throughout. Bronze shaft bearings, located every five feet, prevent shaft whip and vibration. The shaft bearing at inlet vane is grease packed and requires no attention.

Type QBO or QDO has "Cutless" Rubber Shaft Bearings every ten feet which are lubricated by the water being pumped. The shaft bearing at inlet vane is grease packed and requires no attention.

Both types can be supplied complete with modern air-cooled electric motor of hollow shaft type, with quarter-turn belt drive or with right-angle gear drive.

Worthington Turbine Well Pumps are available with capacities up to 12,000 Gpm. for discharge heads to 650 feet or more.



Type QDO Water Lubricated Vertical Turbine Pump

MULTI-V-DRIVES

The Worthington MULTI-V-DRIVE has been developed and perfected by the combined efforts of the Worthington Pump and Machinery Corporation and the Goodyear Tire & Rubber Company. Worthington, the world's largest original equipment manufacturer standardizing on Multi-V-Drives, makes the O.E.M. Precision Sheaves, while the EC Cord V-Belts are made by Goodyear.

In the Worthington Multi-V-Drive, each belt is a separate drive unit and carries its share of the total load. And because of the endless cord construction, each strand carries its equal share of the belt load. Thus *balanced drive performance* is realized. This endless cord V-belt is sheathed with a tough black cover that resists heat, oil and other enemies of long belt life and insures longer wear.

EC Cord Belt Section

The Worthington QD quick-detachable Sheave* uses a new idea in construction that overcomes the difficulty of mounting and removing the sheave. This design incorporates a split hub and a rim. The hub is quickly positioned on the shaft and is held there with a key set screw. The rim is pulled up on a tapered fit with the hub by draw-up bolts, thus insuring a positive press fit to the shaft. Hubs and rims are balanced separately. The QD sheave insures quick removal from the shaft in case of any maintenance problem with unit bearings, motor bearings or motor trouble. There is no lengthy delay in trying to remove the quickly detachable QD sheave from the shaft when faced with a maintenance problem. The QD sheave also permits quick speed changes, it only being necessary to remove the rim to install another size rim without disturbing the hub or sheave alignment.

Each groove in the multiple groove QD Precision Sheave* is identical, assuring perfect balance. Only tough, semi-steel metal that is resilient and close-grained is used. The grooves are polished mirror-smooth and vibration is eliminated by the extremely accurate balance. Each unit is precision gauged and rigidly inspected for minimum tolerances. Add to these features the fact that the QD Sheave* costs no more than an ordinary sheave.

*Patented.

Patented QD Quick-Detachable Sheave

WORTHINGTON PRODUCTS

Air Conditioning Equipment
Refrigerating and Ice-Making Equipment

Diesel Engines Gas Engines Dual Fuel Engines
Air and Gas Compressors Gas-Engine Compressors

Synchronous and Induction Motors Switch Gear
Turbo and Engine Type Generators

Steam Turbine Generators Speed-Change Gears
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Steam Condensers Steam-Jet Air Ejectors Vacuum Pumps
Feedwater Heaters and Deaerators
Water Softeners and Pressure Filters
Pumping Equipment of all Types
Hydraulic Decoking Systems for Oil Refineries
Hydraulic Debarking Systems

Contractors Air Tools Rock Drilling Equipment

Concrete Mixers Paving Mixers Welding Positioners and Turning Rolls
Industrial Mixers Pneumatic Placers and Grouters

V-Belt Drives—(Multi-V-Drive) Variable Speed Drives (Worthington Allspeed Selectors)

Liquid Meters

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